



MUNICIPAL

Pressure Pipe and Fittings Installation Guide

Suitable for Pressure Applications

- C900 Pipe and Fittings
- C909 Pipe
- C907 Fittings
- Certa-Lok® Restrained Joint Integral Bell
- IPS Gasketed Pipe



Pressure Pipe and Fittings Installation Guide

Introduction	4
Receiving	5
Unloading	6
Storage	7
Handling	8
Installation Instructions – Gasketed C900, C909 and IPS Pipe	9-17
Fittings Installation Instructions	18
Thrust Restraint	19-21
Certa-Lok® Restrained Joint Integral Bell Installation Instructions	22-24
Inspection and Testing	25
Service Connections and Tapping	26

Introduction

This guide is intended for use by installers, supervisors, and inspectors responsible for the installation of Westlake Pipe & Fittings PVC and PVCO Pressure Pipe and Fittings. It is not a design manual. Rather, it is intended as a guide for the proper receiving, handling and installation of PVC and PVCO pressure pipe and fittings. If used properly, the information in this booklet can help maximize product performance.

This booklet is not intended to assume the authority of the Design Engineer. System requirements and actual field conditions will vary significantly. The sole responsibility for all design and installation decisions lies with the Design Engineer.

For further guidance, contact Westlake Pipe & Fittings Technical Services:

Phone: 484-435-7474

Email: technical@westlakepipe.com

All Local Health and Safety Regulations must be followed.

This booklet is also available electronically on the Westlake Pipe & Fittings website, www.westlakepipe.com.

Receiving

When receiving a pipe and fittings shipment at the job site, the contractor or purchaser should exercise established precautions. Each shipment should be inventoried and inspected upon arrival. The pipe and fittings are inspected and loaded with due care at the factory using methods acceptable to the carrier. It is the carrier's responsibility to deliver the shipment in good condition, and it is the receiver's responsibility to ensure that there has been no loss or damage.

The following procedures are recommended for acceptance of delivery:

1. Conduct overall examination of the load. If the load is intact, ordinary inspection while unloading should be sufficient to ensure that the pipe has arrived in good condition.
2. If the load has shifted, has broken bundles, or shows rough treatment, carefully inspect each piece for damage.
3. Check total quantities and details of each item against shipping documents.
4. Note any damaged, incorrect, or missing items on the delivery receipt.
5. Notify the carrier immediately and make a claim according to their instructions.
6. Do not dispose of any damaged material. The carrier will inform you of the procedure to follow.
7. Replacements for shortages and damaged materials are not re-shipped without request. If replacement materials are needed, please re-order from your Westlake Pipe & Fittings distributor or representative.

Unloading

The means by which pipe and fittings are unloaded in the field is the decision and the responsibility of the receiver.

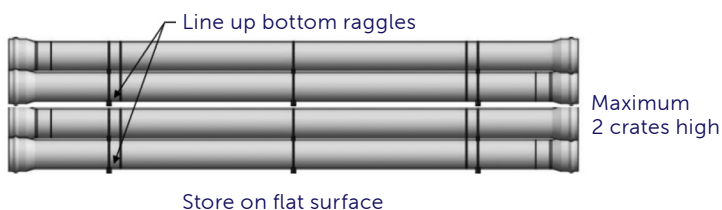
The following recommendations should be followed:

1. Remove restraints from the bundles. These may be straps, ropes, or chains with padding.
2. Remove any boards on the top or sides of the load that are not part of the pipe/fittings packaging.
3. When unloading fittings use industry-accepted means. Use extreme caution when unloading fittings with any type of machinery, as fittings may be fiberglass wrapped for added strength. Damage to wrapping could reduce strength of fabricated fitting. Do not drop or throw fittings into trench. Westlake Pipe & Fittings is not responsible for damage to mishandled pipe or fittings.
4. Using a forklift (or a front-end loader equipped with forks), remove the top bundles of pipe, one at a time from the truck. Never stick forks into the end of the pipe as this could damage the gasket and pipe.
5. If a forklift is not available, use a spreader bar with fabric straps capable of carrying the load. Space straps approximately 2.4m (8ft) apart. Loop straps under the load.
6. During the removal and handling, ensure that the bundles do not impact anything (especially in cold weather).
7. Place pipe bundles on level ground.
8. Do not handle bundles with individual chains or single cables, even if padded.
9. Do not attach lifting cables to bundles or bands.
10. Do not stack bundles more than 2.4m (8ft) high.
11. Protect bundles with packing materials the same way they were protected while on the truck.
12. To unload lower bundles, repeat the unloading process described above.
13. Do not unload pipe bundles by hand. Pipe can be unstable if the bundle is broken-do not open bundles while they are on the truck.

Storage

The following procedures are recommended to prevent damage to the pipe:

1. Store the pipe at the site in bundles.
2. Avoid compression, deformation or damage to bell ends of the pipe.
3. When bundles are stacked, ensure that:
 - a. The weight does not cause deformation of the pipe. The weight should be supported by the dunnage.
 - b. The stack is a maximum of 2 bundles high.
 - c. The stack is stable.



4. Support pipe bundles at 2.4m (8ft) intervals, 1.2m (4ft) from each end on rattles to prevent damage to the bottom surfaces during storage.
5. Store lubricant in tightly sealed containers under cover.
6. Do not store pipe and fittings where gaskets may be exposed to contamination (ie. grease, oil etc).
7. Protect the interior and sealing surfaces of pipe and fittings from dirt and foreign material.
8. When the bundles are stacked, ensure that the stack remains stable.
9. When pipe and fittings are being stored for a prolonged period, the bundles should be covered with a light coloured opaque cover, to protect against exposure to direct sunlight (ozone, UV radiation). The covering should allow adequate air circulation above and around the pipe to prevent excessive heat accumulation.

Note: Some gaskets can be removed prior to installation – refer to Gasket Identification section to confirm if gaskets can be removed from the pipe and fittings.

Handling

The following procedures are recommended for handling pipe and fittings:

1. When unloading and handling pipe and fittings, and when using mechanical equipment, exercise care to prevent damage to the pipe/fittings.
2. Damage to pipe and fittings that have been dropped is not always visible. If the following guidelines are not met, the pipe and fittings should not be used:
 - a. Do not drop pipe/fittings off of the truck
 - b. Do not insert a forklift fork into a pipe end to transport.
 - c. Lower pipe and fittings into the trench, do not drop.
3. In sub-zero (freezing) temperatures, use caution to prevent impact damage. Handling methods considered acceptable for warm weather are unacceptable during very cold weather.
4. When distributing the pipe along a trench (stringing), place pipe on the opposite side of the trench from the excavated earth. Place pipe with bell ends in the direction of the work progress.
5. Pipe caps should be kept in place until the pipe is ready to be assembled.



Installation Instructions

Gasketed C900, C909 and IPS Pipe

The contractor shall follow all local regulations for trench safety.

For further information, refer to AWWA C605 and M23, ASTM F1668, CSA B137.3.

Trench Width

1. The minimum clear width of the trench at the pipe springline should be the greater of either 450mm (18 inches) or the pipe OD plus 300mm (1ft).
2. The maximum clear width at the crown of the pipe should not be greater than the pipe diameter plus 600mm (2ft).
3. If embedment compaction is required, sufficient room between the trench wall and pipe must be present for adequate compaction.

Refer to Figure 1.

Preparation of Trench Bottom

- The trench bottom should be constructed to provide firm, stable and uniform support for the full length of the pipe.
- Bell holes should be provided at each joint to permit proper joint assembly and pipe support.
- Any part of the trench bottom excavated below grade should be backfilled to grade and compacted as required to provide firm pipe support.
- When an unstable sub-grade condition which will provide inadequate pipe support is encountered, additional trench depth should be excavated and refilled with a suitable foundation material as recommended by the project's Geotechnical Engineer. Ledge rock, boulders, frozen materials, and large stones should be removed to provide 100mm (4") of soil cushion on all sides of the pipe and accessories.

Installation Instructions (cont'd)

Laying of Pipe

To prevent damage, proper implements, tools and equipment should be used for placement of the pipe in the trench. Under no circumstances should the pipe or accessories be dropped into the trench.

All foreign matter or dirt should be removed from the pipe interior. When pipe laying is not in progress, open ends of the installed pipe should be closed to prevent entrance of trench water, dirt and foreign matter into the line.

It is good practice (if possible) to lay the pipe with the print line rotated to the top (12 o'clock in the figure below). This will help with the identification of the pipe if it ever has to be re-excavated.

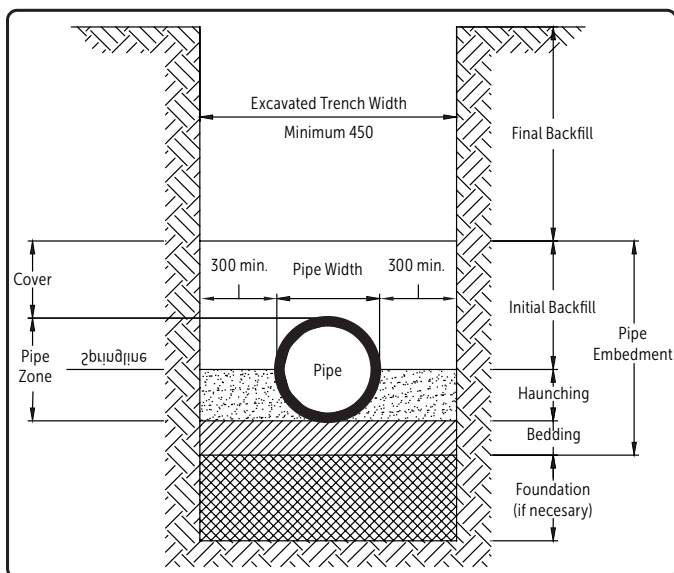


Figure 1 Typical Bedding Detail (Dimensions in mm)

Pipe Embedment

Pipe embedment should:

1. Provide uniform longitudinal support to the pipe.
2. Be worked under the sides of the pipe to provide satisfactory support in the haunching area.
3. Have a minimum initial backfill depth of 300mm (1ft) over the crown of the pipe.
4. Not contain cobbles, large stones, frozen lumps, ledge rocks, or debris.
5. Be properly compacted to provide soil densities as specified by the design engineer.
6. Limit particle size to 19mm (3/4") unless otherwise specified in local requirements or specifications.




To prevent damage to the pipe, compaction equipment to be used directly over the pipe should be limited based on the depth of cover and the depth of influence of the equipment.

Final Backfill

After placement and compaction of pipe embedment materials, the balance of backfill material may be machine placed. The final backfill should contain no large stones or large rocks, frozen material or debris. Proper compaction procedures should be exercised to provide required soil densities.

Assembly of Gasketed Joints

Gaskets provided with Westlake Pipe & Fittings products are identified by shape, colour and size. The chart below identifies the gaskets used with each product.

GASKET IDENTIFICATION CHART					
Product	Size mm (in.)	Type	Material	Remov- able	Cross Section
C900/IB IPS/IB	100 (4) - 900 (36)	Reiber	SBR	No	
			NBR	No	
Certa-Lok RJIB	150 (6) - 300 (12)	Fluid-Tite	IR/SBR	Yes	
C909/IB	150 (6) - 300 (12)	Profile	EPDM	Yes	

Installation Instructions (cont'd)

Assembly of Gasketed Joints (Continued)

1. Remove caps and clean the gasket, bell interior, and spigot area with a clean rag or brush to ensure all debris is removed from bell and spigot ends of the pipe. Check the gasket position. Inspect the gasket, pipe spigot bevel and sealing surfaces for damage or deformation. Be sure that the gasket is installed properly. For unrestrained C900 and gasketed IPS pipe do not remove the reiber gasket as it is locked in during the manufacturing process. Once the Rieber gasket is removed, it cannot be reinstalled due to permanent deformation of the gasket.

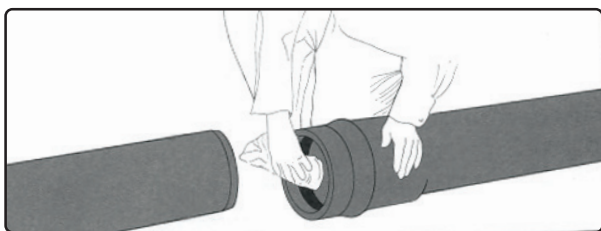


Figure 2 Cleaning gasket and bell.

2. Westlake Pipe & Fittings supplied pipe lubricant is preferred, pipe lubricant must be NSF 61 certified. Apply lubricant to the gasket and spigot from the chamfer to 75mm (3") from the face of the spigot. Use of non-approved lubricants may promote bacterial growth and cause damage to the gaskets or pipe, as well as void the manufacturer's warranty.

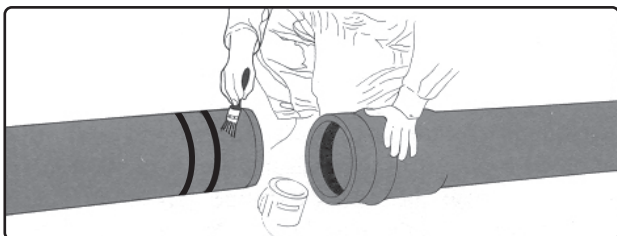


Figure 3 Apply lubricant.

For guidance on usage, see Westlake Pipe & Fittings lubricant usage chart below:

JOINTS PER CONTAINER				
Nominal Size	Joints Per 250g	Joints Per 1kg	Joints Per 4kg	Joints Per 11kg
1.5"	62	250	1000	2750
2"	46	184	736	2025
2.5"	37	146	585	1609
3"	30	120	481	1322
4"	20	81	324	891
6"	12	47	189	519
8"	8	33	130	358
10"	7	26	104	287
12"	5	18	73	201
14"	4	14	56	154
16"	3	12	47	130
18"	3	10	42	115
20"	2	9	38	103
24"	2	7	29	80
30"	1	5	21	57
36"		3	14	38

Installation Instructions (cont'd)

- After lubrication, the pipe is ready to be joined. Straight alignment of the pipe is essential for ease of assembly. Align the spigot and the bell, and insert the spigot into the bell until it contacts the gasket uniformly. Do not suspend the pipe and "stab" it onto the bell. Ensure that the spigot does not touch bedding material during installation. The spigot end of the pipe will be marked by Westlake Pipe & Fittings to indicate the minimum and the maximum depth of insertion.

Insert the spigot into the bell such that the first insertion line is no longer visible and the second insertion line is visible in front of the bell face. See Figure 4 below for correct assembly depth.

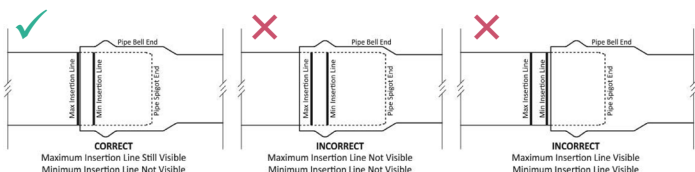


Figure 4 Correct Assembly Depth.

Do not assemble the joint beyond the second insertion line. Joints assembled beyond this line can cause leaks and/or breakage of the pipe bell, and would VOID the pipe warranty.

The assembly can be done by hand, or by using a bar and block (wood) as shown below.

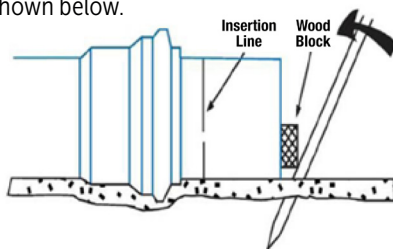


Figure 5 Manual Bar and Block Method.

When unable to assemble using the bar and block method, another mechanical method such as a come-along or a pipe puller should be used. If the backhoe bucket is used to assemble the pipe, extra care must be taken to ensure the pipe is not assembled beyond the second insertion line. A backhoe bucket should never contact the pipe directly, wood should be placed

between the bucket and the face of the bell.

4. Place and consolidate embedment material in the haunching area and initial backfill along the barrel, leaving the previous joint exposed.

After inserting the next spigot, go to the previous joint and check to ensure that cascading of this joint has not occurred. (Cascading occurs when the spigot of the previous joint inserts further into the bell than was originally intended.)

Field Cutting

Pipe can be easily cut with a power saw using an abrasive disc. Other cutting tools may be appropriate, depending on the size of the pipe. It is recommended that the pipe be marked around its entire circumference prior to cutting to ensure a square cut. Both portions of the pipe on either side of the cut line should be supported from below such that neither portion of pipe pulls at the other while it is being cut.

If inserting into a gasketed joint, the newly cut pipe must be beveled and have the insertion marks redrawn. Use a factory-finished beveled spigot end as a guide for proper bevel angle (15 degrees) and depth. Draw new insertion marks at the same distance as the original.

Changes in Alignment

There are multiple methods of achieving alignment changes in a pipeline:

Fittings

Westlake Pipe & Fittings recommends that changes in alignment should be designed and accomplished with the use of fittings. Either push on PVC Fittings (injection molded or fabricated) or Ductile Iron fittings (MJ or Push On) can be used.

The use of a fitting provides for straight insertion of the spigot into the joint, allowing the directional change (horizontal or vertical) to be made quickly and easily during construction. Since different fitting types have different insertion requirements always check the bell depth of the fitting and if necessary re-mark the insertion line on the spigot, to ensure the correct insertion depth is achieved.

Westlake Pipe & Fittings offers a wide variety of molded and fabricated fittings, including 5 through 90 degree bends.

The radius shape of the 5° bend affords virtually no axial forces; therefore, they can be installed without need for joint restraint.

MJ or Push on DI Fittings

Ductile Iron fittings Mechanical Joint (MJ) or Push On in either compact (AWWA C153) or long body (AWWA C110) can be used with PVC pipe. See the fitting manufacturer's recommendations for alignment changes and deflections available with this type of fitting.

Angular Deflection in the Joint

The small amount of offset allowed by angular deflection should be reserved for installation irregularities and not utilized in the pipeline design for alignment changes. The use of fittings is recommended for greater changes.

Procedure

1. Insert the spigot into bell; stop inserting when the first insertion line is even with the face of the bell.
2. Check to ensure that spigot is in straight alignment with the bell.
3. Manually, move the other (bell) end of the pipe to achieve allowable offset.

Maximum angular deflection of Westlake Pipe & Fittings IB (standard gasketed pipe) is 1 degree per joint. For pipe manufactured in Abbotsford, BC, 4" – 12" C900 trade sizes have a maximum angular deflection of 2 degrees.

For reference purposes 1 degree of joint deflection is equal to a 100mm (4") offset for a 6.1m (20ft) piece of pipe.

Longitudinal Bending of Pipe Barrel

This should be only be used when minor directional changes are encountered during construction. Longitudinal bending can cause increased wall stresses, therefore it is generally not recommended to tap pipe that has been longitudinally bent. Above 300mm (12") trade size, Westlake Pipe & Fittings recommends alternate means of changing pipeline direction.

1. Insert the spigot into bell, leaving the second insertion line showing,
2. Place and consolidate haunching and initial backfill along one third of the pipe including the joint you have just assembled.
3. Place compacted backfill at the inside of the curve at the mid-point of the pipe length to form a fulcrum.

4. Manually, move the other (bell) end to achieve the offset desired. See Table 1 below.
5. Place and consolidate the remaining haunching and initial backfill
6. Remove pry bar from against the bell.

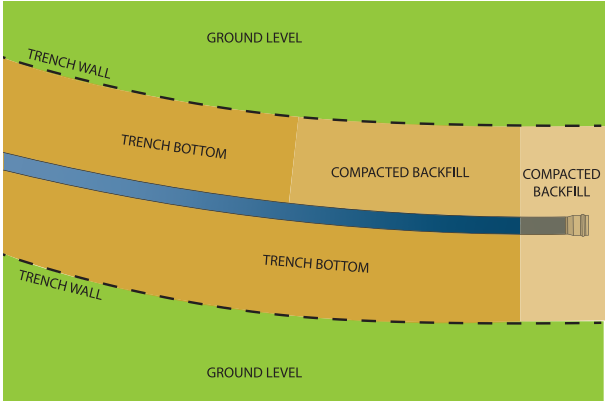


Figure 6 Longitudinal Pipe Bending.

Pipe Diameter mm (in)	Max. Angle of Deflection
150 (6)	4.0°
200 (8)	3.0°
250 (10)	2.5°
300 (12)	2.1°

Table 1

Never combine angular deflection and longitudinal bending.

For open cut installations, many restrained joint products like Certa-Lok prevent over deflection of the joint. Certa-Lok allows for several pipe segments to be strung together prior to bending. Stringing pipe before bending eliminates the challenges of bending individual segments. For further details, refer to the restrained joint sections of this guide.

Fitting Installation Instructions

Follow pipe to pipe field cutting and assembly instructions previously provided.

Note: If there is a large resistance force to the insertion of the spigot into the bell, the gasket may have become dislodged. In this case, disassemble the joint to ensure the gasket is in the correct position and then re-assemble the joint as per the instructions above.

Ductile Iron Fittings

Ductile Iron Fittings have shallower bells than PVC Fittings. For M-J Ductile Iron Fittings, the edge of the pipe should be square cut. For Push-On Ductile Iron Fittings, a small chamfer 9.5mm (3/8") is required. For more detailed information about assembly to Ductile Iron Fittings, please contact the fittings manufacturer.

Deflecting the Joint at PVC Fittings

The maximum angle of deflection is 1° for all sizes of Westlake Pipe & Fittings manufactured PVC pressure fittings. This is equivalent to 100mm (4") of deflection over a 6.1m (20') length of pipe.

When deflecting the pipe/fitting joint, use the following procedure:

1. Assemble the pipe/fitting joint such that there is a 13mm (1/2") gap between the maximum insertion line as per Figure 4 (page 14), and the edge of the bell. This gap will allow more movement at the end of the pipe.
2. Shift the bell end of the 6.1m length of pipe 100mm (4") in the direction of deflection.

Pipe to Pipe and Pipe to Fitting Assembly Notes

- Never push directly against the pipe by any mechanical means (pry bar, hook, etc.). Always place a block of wood between the face of the pipe bell and the bar. This will protect the pipe from damage and help to ensure even distribution of the force pushing the pipe.
- Any means of assembly must allow for straight alignment of the bell and pipe during assembly. Pushing or pulling on one side of the pipe, causing misalignment of the pipe and bell, is not acceptable.

Thrust Restraint

- Smaller diameters of pipe and fittings can generally be assembled by hand. Larger diameters of pipe may be assembled using a come-along or jacks and pulleys. A backhoe is not a recommended tool to push pipe/fittings together due to the potential for over insertion.

Thrust restraint should be provided at each hydrant, valve, bend, tee and at reducers or fittings where changes occur in pipe diameter or direction.

There are two common methods of restraining PVC pressure pipe and fittings in the field:

Concrete Thrust Blocking

Concrete thrust blocks shall be cast in place and poured against undisturbed soil. Pre-cast blocks are not permitted. For vertical changes in direction, the fitting should be anchored to the thrust block, see examples 9 and 10 in Figure 6.

The size and shape of concrete thrust blocks shall be as specified by the designer.

Thrust Restraint

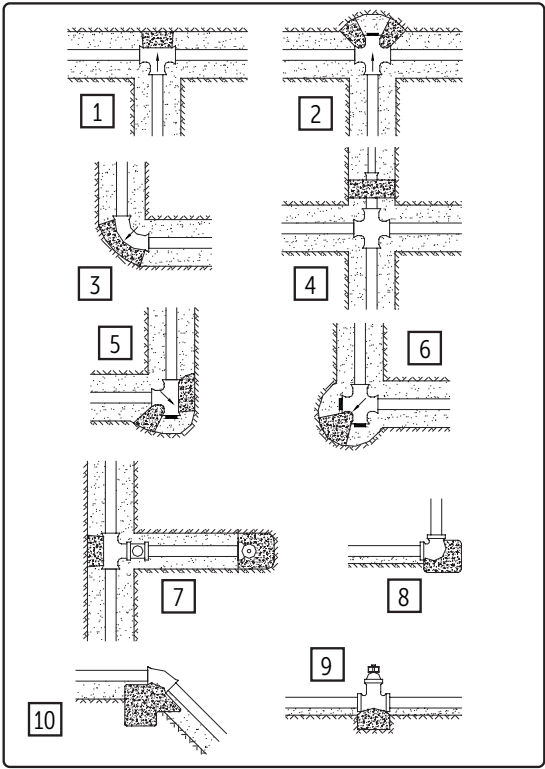


Figure 7 Thrust Block Detail.

- | | |
|---|--|
| 1 Through line connection (tee) | 6 Direction change (cross used as elbow) |
| 2 Through line connection (cross used as tee) | 7 Hydrant Tee |
| 3 Direction change (elbow) | 8 Hydrant Boot |
| 4 Change line size (reducer) | 9 Valve Anchor |
| 5 Direction change (tee used as elbow) | 10 Vertical direction change (bend anchor) |

Mechanical Joint Restraint

Westlake Pipe & Fittings will accept the use of any restraint device that carries third party certification to ASTM F1674 (American Society for Testing and Materials), FM (Factory Mutual) and UL (Underwriters Laboratories). It is the responsibility of the restraint manufacturer to supply the necessary supporting data to prove that their product complies with these requirements and is compatible with the pipe/ fittings.

The length of restrained-joint piping shall be as per the designer.

It is important to note that Westlake Pipe & Fittings does not assume liability arising from the use of any external restraints on pipe or fittings manufactured by Westlake Pipe & Fittings.

Joint restraint criteria for C909 pipe can differ from that for C900 pipe. Consult with the restraint manufacturer for specific requirements for C909 pipe. This also applies to glands utilized with MJ fittings.

Certa-Lok® RJIB Installation Instructions

Westlake Pipe & Fittings restrained joint systems are self-restrained C900 pressure pipe systems that can be used for trenchless or open-cut installations. These systems include CIOD pressure pipe with bell and spigot; and nylon splines used to lock the pipe bell and spigots together.

These restrained joint products are standard C900 pressure pipe with grooves cut into the pipe wall at the spigot end. The pipe is locked together by lining up the pipe grooves with the bell grooves and inserting a nylon spline.

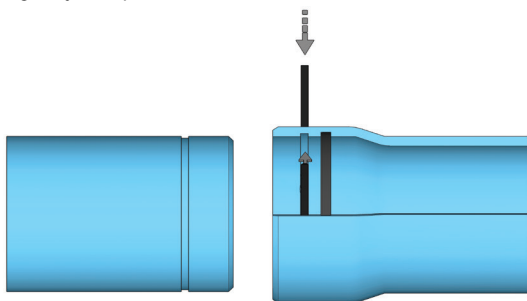


Figure 8

Assembly

1. Inspect & Clean Bell Socket

- Using a wet rag, clean out all dirt and other material from inside bell sockets including the spline grooves and gaskets. Couplings and other female fittings are shipped with the gaskets already installed.
- Inspect the gaskets for any tears, gouges, cracking, or other defects. Make sure the gaskets are seated evenly in the bell's grooves without falling out, bunching up, or being twisted. Adjust the gaskets' positions as necessary.
- Contact the Distributor for replacement of any questionable gaskets. Do not install pipe into bells having questionable or deformed gaskets.

2. Inspect & Clean Male Spigot End

- a. Using a wet rag, clean off all dirt and other material from the outside surface of the pipe spigot, up to and including the spline grooves.
- b. Inspect the spigot edge for a consistent, undamaged bevel. Do not use pipe spigots with disfigured bevels that could damage the gasket when inserted into the bell.

3. Lubricate (See page 13 for Lubricant Usage Chart)

- a. **IMPORTANT:** Use an NSF approved potable water pipe lubricant only!
- b. Spigot End – Using a brush, apply lubricant to the pipe exterior from the beveled edge back to the spline groove. **DO NOT** lubricate the spigot spline groove.
- c. Bell – Apply lubricant to the exposed surfaces of the installed gasket. **DO NOT** lubricate the bell spline groove.
- d. Wipe off any excess lubricant.

4. Assemble Joint

- a. Rotate the bell so the spline hole is accessible for spline insertion.
 - i. For applications with pipe sitting on the ground, the spline hole should be at or near the top so the spline enters horizontally.
 - ii. For applications with the pipe in a narrow pit, the spline hole should be at the side so the spline enters vertically.
- b. Align the spigot end of the pipe so that the spigot is entering the center of the bell and the two pieces are in straight alignment. The spigot must not be inserted into the bell at an angle; this may damage or dislodge the gasket.
- c. Using mechanical means if necessary, push the spigot straight into the bell so the spline grooves align. The bar and block method of assembly is recommended, although larger pipe may require mechanical assistance.
- d. If the pipe does not easily insert – **STOP** – check the bell, spigot, and gaskets for issues. Clean or lubricate as necessary.

5. Insert Spline

- a. DO NOT lubricate the spline!
- b. Insert the pointed end of the spline into the bell spline hole. For rectangular splines, the wider face should be parallel to the length of the pipe. For square splines, either face can be parallel to the length of the pipe.
- c. Push the spline into the spline hole until the spline "bottoms out". It may be necessary to use a Westlake Pipe & Fittings Spline Insertion Tool or mallet. Approximately, 1" to 3" of the spline should extend beyond the connected pipe joint.
- d. It is not necessary to trim the excess spline "tail". Trimming the tail will not affect the strength of the joint but may make disassembly very difficult.

Field Grooving

Certain products are manufactured with thickened spigot ends to accommodate the Certa-Lok groove while maintaining their designed performance ratings. Grooving a non-thickened pipe body will result in a less-than-designed performance for the new joint and ultimately the entire system and is therefore not recommended. A fitting or adapter must be used rather than direct connection of shortened pipe to new pipe.

Horizontal Directional Drilling (HDD)

When pulling restrained joint products using HDD, do not exceed the recommended maximum pulling force or bending limits shown below.

RECOMMENDED MAXIMUM PULLING FORCE & BENDING LIMITS					
	Trade Size (in)	DR	Minimum Bend Radius m (ft)	Maximum Pulling Force kN (lbf)	Max. % Change per 20' Stick
Certa-Lok RJIB	6"	18	43.9 (144)	89.4 (20,100)	7
		14		99.2 (22,300)	
	8"	18	57.3 (188)	122.4 (27,500)	5.25
		14		138.0 (31,000)	
	10"	18	70.7 (232)	220.3 (49,500)	4.37
		14		234.1 (52,600)	
	12"	18	83.8 (275)	267.0 (60,000)	3.68
		14		267.0 (60,000)	

Table 2

Inspection and Testing

Good practice dictates pressure testing portions of lines as they are completed in advance of the entire system.

The following three points should be considered when testing:

1. The pipe to be tested must be sufficiently backfilled to prevent movement while under test pressure.
2. Thrust restraint at fittings should be permanent and constructed to withstand test pressure. If concrete thrust blocks are used, sufficient time must be allowed before testing to permit the concrete to cure.
3. Test ends should be capped and braced to withstand the thrusts that are developed under test pressure.

Pressure Acceptance Test

A pressure acceptance test is recommended. The test pressure and duration shall be as specified by the Design Engineer or as per AWWA C605. The test pressure should never exceed the pressure rating of the pipe and fittings being tested.

Relieving Air From Pipeline

The pipeline should be filled as slowly as possible (not faster than 1 ft/s) to avoid any unnecessary surges and entrapment of air. Venting air from the line is of utmost importance. Pressure pipe is seldom laid to flat grade, so there are high and low sections along the line. If the high section elevation is above the low part of the line, a larger amount of air will be trapped. Corporation stops or automatic air relief valves should be installed at these points. Air can be blown from hydrants in pipe sizes up to 200mm (8"). In larger diameter pipes, air will not enter the hydrant branch, therefore it will be necessary to install air release valves at high points.

The line should be filled slowly with water to static pressure, and all air vents opened to allow air to escape. The line should be filled at a rate that allows air to leave the line at the same rate. It is recommended practice to let the line remain under static pressure for at least 15 minutes. All air valves should then be opened again to allow any remaining air to be released from the line, after which the line may be brought up to full test pressure. Test pressure should never exceed the pressure rating on the pipe and fittings being tested.

Disinfection of Potable Water Lines

Follow AWWA C651: *Disinfecting Water Mains*

Note: Air pressure testing of installed PVC and PVCO Pressure Pipe is expressly prohibited for safety reasons.

Service Connections and Tapping

Service lines can be connected to Westlake Pipe & Fittings PVC and PVCO Pressure Pipe by the following methods:

Fittings – Tap Couplings

Fittings which provide a threaded service connection are available from Westlake Pipe & Fittings.

Tapping

The PVC Pipe Association publishes a comprehensive PVC Pressure Pipe Tapping Guide at <https://www.uni-bell.org/Portals/0/ResourceFile/pvc-pressure-pipe-tapping-guide.pdf> for guidance on making service taps on Westlake Pipe & Fittings PVC pressure pipe.

Tapping – General

Only C900 PVC pipe can be direct tapped. C909 PVCO pipe should never be direct tapped.

Saddle tapping can be used for both PVC and PVCO Pressure Pipe.

Never tap in an area of the pipe that has been bent.

Basic Safety Precautions

When drilling or tapping any pressurized water pipe, basic safety precautions are advised to assure personal safety of the workers in the event of a sudden and unexpected pipe failure.

All local Health and Safety Regulations must be followed.

Although such failures are extremely infrequent, the following safety practices are recommended.

- A second worker or supervisor should always be present in the immediate vicinity when making "wet" taps. In addition, workers should be positioned at isolation valves.
- Protective clothing: including hard hat, safety shoes, goggles or face mask, should be worn. Means of quick egress from the trench must be available.
- A heavy protective blanket, 1.2m x 1.8m (4ft x 6ft) should be used to cover the exposed pipe in the area of the tap. The blanket should have a hole in the center permitting access and operation of the drilling and tapping machine.

